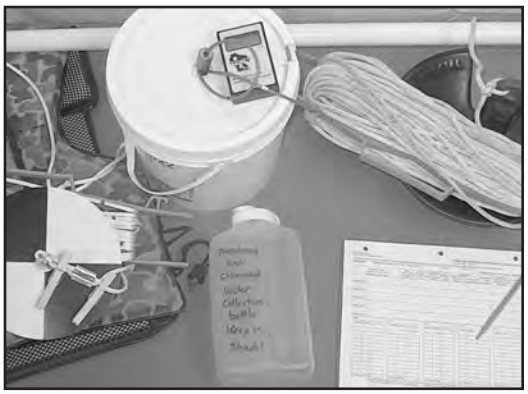
7. CHEMISTRY MONITORING:

Phosphorus and Chlorophyll

Before you start sampling, be sure to read the following pages to familiarize yourself with the equipment and the procedures that you will be using. *All of the procedures that you will follow in sampling your lake are done for specific reasons. It is very important that you follow the sampling procedures exactly as they are laid out in the following pages to ensure good, consistent, high quality data. The following pages will provide you with sufficient background on the design of the equipment and proper procedures to use.*



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Please remember to keep all sampling equipment and chemicals out of the reach of children. Many of the chemicals you will be using are hazardous (see Appendix 1). After sampling, it is very important to rinse and air dry thoroughly all of the equipment that you used. As always keep paperwork and envelopes separate from equipment.

What Equipment Will You Need?

At your training session, your Self-Help regional coordinator will outline and provide all of the equipment that you will need to successfully monitor your lake. If you are participating in the Self-Help network as a chemistry volunteer you will receive the same equipment that a Secchi volunteer uses to determine water clarity. In addition, you will also receive equipment and chemicals for your water chemistry (phosphorus and chlorophyll) analysis. This list includes everything that you will need while you are on and off the lake.

- ☑ Manual
- ☑ Lake map with sampling site marked
- ☑ Integrated water sampler
- ☑ A large plastic tub containing: 500 or 1000 ml flask, filter cup, pump and tube, squirt bottle (to be filled with distilled water that *you* provide), juice jug for collecting phosphorus chlorophyll water samples, filter membrane, 250 or 500 ml graduated cylinder, sulfuric acid vial, "acid added" stickers, safety goggles and gloves, pH testing paper, waxed paper, mailing tape, pencils, and a waterproof pen.
- ☑ Life jacket (you provide)
- ☑ Anchor and rope (you provide)
- ☑ Field data sheets
- ☑ Pencil and waterproof pen
- ☑ 3 trays of ice cubes

The following supplies will be provided to you by the Self-Help network to send your collected water samples to the State Laboratory of Hygiene for analysis:

- ☑ Styrofoam® mailer
- ☑ 250 ml bottle for the phosphorus sample
- ☑ Zip-lock bag for phosphorus bottles
- ☑ Chlorophyll tube and baggies for ice cubes
- ☑ Carbonless data forms
- ☑ Postage paid envelopes for mailing
- ☑ Chlorophyll sample stickers
- ☑ Phosphorus sample stickers
- ☑ State Laboratory of Hygiene analysis forms
- ☑ Merchandise return labels for mailers
- ☑ Priority mail stickers

How Do You Prepare to Sample?

The Day Before You Sample

The day before you are planning to sample your lake, you should always check to see that your equipment is in good condition. Make sure you have three trays of ice cubes available and your squirt bottle is filled with distilled water. Distilled water can be purchased at your local grocery store but be sure it is labeled *"distilled* water" **not** *"drinking* water" or *"pure* water". Try and plan to sample two weeks after ice out and once during the last two weeks of June, July, and August. Do not take your chlorophyll sample two weeks after ice out as algae will not be growing yet. Sampling early in the week (e.g., Monday through Wednesday) is advised as it allows your samples to arrive at the State Laboratory of Hygiene in a timely fashion.

The Day You Sample

On the day you plan to sample, complete the top portion of your field data sheet by filling in the "WBIC", "STORET", and "Volunteer ID" sections. If you do not know what these numbers are contact your Self-Help regional coordinator. Before you launch your boat, make sure you have an anchor, sufficient gas, and personal flotation devices in your boat before proceeding to your sampling site.

Sampling Overview

Water Sampling

To collect water samples for phosphorus and chlorophyll, you will use one of two types of water samplers. Currently, the Self-Help network uses both an integrated water sampler and a Van Dorn water sampler to collect samples for analysis.

The integrated water sampler is a six and a half-foot PVC pipe that serves as a collection tube. At the bottom of the tube there is a PVC ball that acts as a water-locking mechanism. To take your sample, slowly lower the tube as straight as possible vertically into the water to the tape wrapped on the tube (a depth of six feet). After lifting the tube, you will have collected an *integrated* sample that is a *mix* of water from the surface to six feet deep in the water column. The water in the integrated sampler will be released when the integrated sampler is placed on top of the water collection bottle. The ball will be displaced by the bar on the neck of the juice jug, releasing the water. Contamination can occur if you touch the end of the integrated sampler or if it lies in the bottom of your boat and touches oil or gas. Please keep your integrated water sampler clean. The collection end should be rinsed with distilled water prior to storing. The water sample in the juice jug will be used to fill your State Laboratory of Hygiene phosphorus sample bottle. The remainder of the water in the juice jug will be used for your chlorophyll analysis. Your regional coordinator will train you in how to use the integrated water sampler properly. When the sampler is not in use, it is very important to store the sampler upside down to dry. Storing the sampler vertically upside down between use prevents possible algae and bacteria growth which could contaminate future samples.

Some volunteers still take one sample at a depth of three feet with the Van Dorn sampler to collect water for phosphorus or chlorophyll analysis. The Van Dorn water sampler is different type of sampler than the integrated sampler. The Van Dorn sampler is a plastic collection bottle with rubber stoppers at each end. This type of sampler is able to collect water at a specific depth- not a mix of water from multiple depths like the integrated sampler. When the Van Dorn sampler is lowered into the lake, water will enter the plastic bottle. Once the sampler is at the appropriate depth, a brass "messenger" is dropped down the line to snap the sampler closed with the water sample inside. Although the Van Dorn sampler works well to collect water for chemistry analysis, for consistency purposes, the network hopes to have all volunteers using the integrated water sampler to collect water samples for phosphorus and chlorophyll testing.

Phosphorus Sampling

As discussed above, the water you collect for your phosphorus samples will be analyzed by the State Laboratory of Hygiene. Since phosphorus is measured in very small amounts, it is important that "clean" sampling techniques be used. *Be careful not to touch the inside of the State Laboratory of Hygiene sample bottles or caps or the water as it is being poured from the sampler into the bottle as your fingers may have some phosphorus residue on them.* Phosphorus contamination can come from a variety of sources, including soaps, dishwashing detergents, or lawn fertilizers. To further reduce possible contamination, make sure the sample bottle caps rest upside down as you fill the bottles.

Before mailing your phosphorus sample to the State Laboratory of Hygiene for analysis, it must be preserved (or "fixed") by adding sulfuric

acid. Once the acid is added, the sample is stabilized. You must check the pH of your "fixed" phosphorus sample before sending it to the State Laboratory of Hygiene. To do this, after adding the sulfuric acid, mix the sample and pour a few drops into the lid of the bottle. Then pour the few drops from the lid onto a sheet of waxed paper. Withdraw and tear off approximately 2 inches of litmus paper and dip in solution on the waxed paper. Remove and promptly compare with specimen colors on dispenser to determine corresponding pH. A properly mixed sample will have a pH of 2 or less. Remember to always wear your safety goggles and gloves when handling sulfuric acid to prevent injury to your hands or eyes and flush any spilled acid with water (see Appendix 1 for further detail on sulfuric acid).

Chlorophyll Sampling

Your chlorophyll sample should be collected once during the last two weeks of June, July, and August. Since there is little algal growth in early spring, there is no need to sample chlorophyll until June. The integrated water sampler will collect a sample from the first 6 feet of the water column. This depth contains algae that are representative of species that live in the upper layers of the water column. After collecting your sample, transfer the water to the clean plastic juice jug provided for your use. Since the green chlorophyll pigment degrades quickly in sunlight, it is essential that you place the juice jug in a cool, shady spot as soon as you can. In addition, all processing of the sample should be conducted on shore and out of direct sunlight.

The amount of water that you will filter is directly dependent on what the Secchi depth of your lake was on the day you sampled. As discussed starting on page 11, measuring Secchi depth is one way to estimate the concentration of algae in the water. The deeper you can see the Secchi disc, the fewer algae there is in the water and vice versa (i.e. the shallower the Secchi disc reading, the more algae there is). An exception to this would be lakes with turbid or naturally stained water. Since there is a proportional relationship between Secchi depth and the amount of chlorophyll present, the deeper the Secchi reading, the more water you will have to filter to collect enough algae to measure (see table on page 7.11). Once you have determined the volume of water that you will need to filter, you will pour that volume from the plastic juice jug into your graduated cylinder for a precise measurement. Note that although the upper cup of the filtering apparatus can be used to measure water volume, it is not an accurate measuring device and should not be used to measure the volume of water you need to filter. It is important that you not put place your fingers on the filter paper or in the water sample as the natural oils found on your skin may degrade the chlorophyll in the samples. Use the tweezers provided to place the filter on and to remove the filter paper from the filtering device. Be sure to only use the white filter paper and not the blue filter divider sheets. After the water has been filtered to extract the algae, the filtered water may be discarded. Only the residue on the filter paper will be analyzed. After you are done filtering, the filter paper sample must be kept in the freezer until you send it to the State Laboratory of Hygiene to be analyzed.

ON LAKE PROCEDURES

How to Collect Water Samples

Integrated Water Sampler

Please note that although the Van Dorn sampler has been used in the past to collect water for chemistry analysis, for consistency purposes, the network hopes to have all volunteers using the integrated water sampler to collect water samples for phosphorus and chlorophyll testing.

STEP 1. The lake that you are sampling should be at least 10 feet in depth in order to use the integrated sampler. Rinse the integrated sampler with lake water. Fill the sampler with lake water and empty the water out of the top of the sampler. This will clean out any dirt or dust that may have gotten in the sampler during transport or storage.

STEP 2. Open the juice jug and place it in an accessible spot. Always place the cap top-side down to prevent contamination.

STEP 3. While holding onto the rope end (top) of the integrated water sampler, slowly lower the collection end (bottom) of the sampler tube into the water column until the water level reaches the six-foot mark on the sampler. Try and keep the sampler as vertical as possible when lowering it into the water. Raise the sampler out of the water.

STEP 4. Drain the integrated water sampler by touching the collection end of the sampler to the rod in the juice jug neck. Water will drain from the integrated water sampler tube into the juice jug. This water will be used for your phosphorus and chlorophyll samples.

STEP 5. To prepare your phosphorus sample, remove the cap from your 250 ml State Laboratory of Hygiene bottle. Always place cap topside down to prevent contamination. Pour water from the juice jug into the bottle. Avoid touching the mouth of the juice jug and the phosphorus bottle lip to prevent contamination. Replace the cap. Complete the information on a phosphorus sticker using a pencil and attach the completed sticker to the bottle.

STEP 6. The remainder of water will be used for your chlorophyll analysis. It is important to keep the chlorophyll sample cool and out of direct sunlight until you return to shore.

STEP 7. Store your integrated sampler top side down. This will prevent algal growth between the ball and the collection end of the sampler.